

DRAGON USER

A stylized red dragon head and neck logo, facing left, with its tongue flicking out.

The independent Dragon magazine

85p

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April 1986

A colorful cartoon illustration of a knight in a green tunic and red pants running through a stone-paved courtyard. He is holding a small yellow dragon in his right arm and a basket of gold coins in his left. To his left, a large white and blue eagle is perched on a tree. In the background, there is a castle with towers and a blue sky with clouds. A black dragon is visible in the upper right, and a blue dragon head is in the lower right.

Clever Code

DIY Expert

Micro Vision Compo Communication



DRAGON USER



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How to submit entries

The quality of the material we can publish in
Dragon User each month will be a very great
factor in the quality of the quality of the
magazine that you can make with good
Dragon. The Dragon database was launched
on to the market with a powerful version of
Basic, but with very poor documentation.

Articles which are submitted to Dragon
User for publication should not be more than
5000 words long. All submissions should be
typed. Please leave wide margins and a
double space between each line. Punctuation
should wherever possible be computer
printed so please write pages and let us know
just if you do so the program.

We cannot guarantee to return every
submitted article or program, so please keep
a copy. If you want to have your program
returned, you must include a stamped,
addressed envelope.

Contents



News

Cashew: Studio Music update —
Share report from Credit — Plus follow up
Share in London — Married to organize
two computers this year — Details inside
— Plus Total Scope Update and more!

Communication

Have you got a problem? Help we want to
hear about it! Send all your Dragon related
queries to us and get results fast! Or maybe
this is your chance to help someone out?

Letters

Your chance to express your views in
thousands of other Dragon Users. This
month (amongst others) — more bulletin
board letters — update on OS-8 users
group — the very last word on conversions
— plus your letter (perhaps) that a next
month and 47!

People's Chart

This is a list of the results of the first People's
Chart compiled by you the Dragon User —
also your chance to vote in Chart Number
Three: "What's Your Vote?"

Expert System

They say everyone is an expert at some
thing — so why not by creating your own
expert system? Examples programs by Peter
Whitaker

Hardware

The new IXT controller from Com-
puterware opens up real new applications
for your Dragon — from budget alarm to
treasure! What Roy Cooke expressed?
Read on for details

4 Destructor!

The Earth is in peril — yet again — and
naturally only you can save it! Defeat the
three baddies that are set to blow our world
to bits — all in machine code from the
keyboard of Steve Gathorne

5 Machine Code Tutor

Master Jason Orban and Geoffrey
Campbell continue our exploration into the
world of machine code — this month
discussing chip architecture and flow
charting

6 Software

Jason Orban's selection for this month —
the good the bad the ugly and everything
— can you afford to read this?

Dragon Answers

More technical answers to a whole bunch of
reader's technical — and not so technical
questions — from the keyboard of the
seasonally knowledgeable Brian Geddes

Adventure Trail

Mike Gernard collecting your assortment
of words and things of the adventure world
and puts them back on the straight and
narrow. Test game

Firmware

All good things come to an end — and
ending by the final bag, this one has been
particularly popular. The final instalment of
the Dragon Firmware guide

Competition

Gordon Lee presents 100 improbable this
month and sets the usual brain teaser —
which presents you with a chance to win a
copy of their Visitor's Newsletter

Editorial

ORDERING goods by mail has always been a bit of a strange business. For
a start, apart from the weather glossy household catalogues, the range of
goods available via this strange transaction always seem to be — well — a
bit out of the ordinary. Take a look at the classified ads in your Sunday
newspaper. Wholesale conkers, Toppens and 3-Hey spec... hardly run
of the mill. Plus, if you think about it, the actual act of faith in sending some
money off to a strange address and hoping something will come back
seems on a par with expecting trains to run on time, or England to beat the
West Indies. And when it does arrive — is it really what you wanted in the
first place?

Luckily for us, retail crooks are very rare and far between in the computer
market, but as recent events have shown, delays that drag on for weeks and
months cause unnecessary worry, are downright frustrating and (worst of
all) cause a lack of confidence in the system that hits every company —
good and bad. So what can the consumer do?

You can always read the reviews in Dragon User of course, but this is the
area where shows come into their own. At a show, you can meet the people
behind the companies. Look at the goods and form your own opinion, chat
to other users. Even if you can't move it to a show physically, you can bet
that if someone is exhibiting regularly, then they are run by enthusiastic,
entire Dragon supporters.

So, if there's a show near you, why not pay it a visit. In fact, you'd be def-
nitely. As the lawyers say, "Let the buyer beware".

South Wales success

THE Dragon comes home to Wales after held on 15th February in Cardiff was by all accounts quite a success — with a total attendance of around 700 Trade supporters included Betsy Compuser Computer Magazine Group and John Pearn. Pearn comments and Patrick: "Every one that came seemed happy" and John Pearn: "And we also enjoyed quite a few nice nights. The event generated a great deal of interest — with people coming from as far away as Birmingham — and coverage from GWR Radio and the Western Mail."

So much so in fact that a repeat performance is already in the advanced planning

stage — this time to be held in the Leeds area in the middle of May.

But in addition to the usual trade exhibitors John is hoping to encourage users to come along and actually show the public what varied uses they can put to "Radio controlled and Model train controllers, that kind of thing explained John. "We're trying to show people what can be done with their computers." He added: "We're continuing to support the Dragon in every way we can — I'm trying today at all aspects of Dragon use — not just a one-day show."

Anyone who feels they have a project that might fit in interest, contact John Pearn on Bardon (04293) 0376.

Eclipsed

FOLLOWING coverage of delays in the game Total Eclipse (Dragon User March 1986) West Midlands Consumer aid workers notified electronic train designers' readers

Although at the time of going to press, Eclipse was available for download, reports were coming in of the arrival of the game from all over the country. As soon as our copy arrived, expect a full review. Watch out (empty) space



Extra!

NEWS that will interest potential purchasers of Shaolin Master (Dragon Master) — the game now has an extra bonus: a Challenge Screen between bouts — but don't worry if you've already bought it. Quickbeam's Dave Hickman is offering the upgrade to ex-

isting owners just for the postage. Send your tape back to them with the appropriate number of stamps and you'll get your upgrade for no extra charge.

For last time purchasers (the price remains at £7.95 plus 80p P&P) Contact Quickbeam Software, 67 Old Newing Road, Broadstone, Dorset DT10 1BN.

Hold the Bus!

ANDYON Data Design are now offering a BUS Expansion available to the Dragon or Tandy colour computer user. Called Addbus it consists of a Buffer cartridge and a compact disc slot Expansion Unit. Cartridges can be used with Disk Interfaces or used simply as a peripheral I/O Expansion Unit. The user is offered the choice of cartridge selection from a digital switch or under software control either from cartridge or local program. Additionally 8 to 16 1/2-gigabyte Port configured as a Centronics

Printer interface is a standard in-built feature.

Addbus future plans include the release of an 88 column card, 160k Data Card and RAM Expansion, all with the microchannel upgrade in mind.

Addbus is offered as part of PCRs cartridge case and contains comprehensive manuals at £28.00. Also available fully built and tested. For full details please write to: Andyon Data Design, 40 Parkway Road, Harrow, Middlesex HA1 3UD.

Now Showing

YET more show news: this time from Microsoft, who are holding the 88000 Convergence, one in London in November and one in CMOS in Manchester to be held over the weekend of April 5th and 7th.

Apart from trade exhibitions (already 12 in number) a major feature of the convention will be a series of lectures (three per day) covering various aspects of 88000 computing

supported by a panel of experts to answer extended question and answer sessions after each lecture. Microchannel are also throwing open the doors to any user groups or education clubs that want to use the facilities. Entrance is expected to be £1.75 for adults. 75p for children. Send applications: Jennifer Price, "We're expecting to take Manchester by storm!"

For further details about accommodation venue and availability of club space contact Jennifer on 02055 66620 or write to Box 56, St Austell Cornwall PL25 4WB.

Weekend away in Wales

IF YOU'RE still thinking about going to the Dragon Week and in Wales (see Dragon User Feb 1986) at the end of the month you'd better make your mind up soon! Says event organiser Bob Morgan: "Bookings are going very well but some places may still be available. It is looking forward to an exciting weekend! But is particularly looking for a few more experienced OS. Bookings are still a bit up of late, why not give it a try?"

The event will be held at the Trehoddan Hotel, Aberystwyth in Gwynedd over the weekend of 21/22nd with a variety of talks and demonstrations planned — including an appearance by our very own Brian Cudge on the Saundby.

The cost, fully inclusive of accommodation and meals will

be £55 per person. Interested parties contact Bob at the Med Wales Tourism Centre on 0954 2054.

Black Box

UNTIL recently, the major problem with connecting joystick for the Dragon has been that the actual connection has started to be costly, particularly involved in the materials, hence, inevitably. However, these clever Pearn people have come up with a remedy in the shape of a little black box called the Dragomaster. The box just plugs in between the unconnected 9-pin Atari-type joystick and your computer — it is as simple as that.

Initially, Pearnsoft will be supplying the Dragomaster only with the Quickbeam 40k Atari-type joystick — at an indicative price of £14.95.

Contact Pearnsoft at 48 Queen Street, Bournemouth, Dorset BH1 1BB. Tel: (02066) 755252.

Communication

Send in your questions, requests, and plans to Communication, Dragon User, 12-13 Little Newport Street, London WC2E.

Problem I have acquired a copy of Spectralator (Radio Shack for Terry Co-Co) a spreadsheet in cartridge form. Is there any way I can get it to perform on my Dragon 32? I have no instructions for it and every time I start it I get the spread-sheet layout and an entry request. Pressing keys registers a very slow response, but I am unable to transfer data from the entry line to the spread sheet. The Enter key generates a command error message. Can anyone help? Alternatively, is there a good spreadsheet Database available on cartridge?

Enquirer Robert Brown 150 17 Arden Road, Ladbarn Co Arden BT26 3AL.

Problem Pokes or mistakes required to disable Lark Creek key and Reset Button.

Enquirer Alan Barton, 11 Asquith Road, Essex SS16 5CH.

Problem Please help a Spanish boy who will live in your country as months. Where can I find a Dragon available to use or rent in London?

Enquirer Angel Garcia 55

Riveride Gardens King Street London WC2.

Problem Sometimes when I try to load a programme cursor disappears too soon and the program does not load. Could you please help me?

Enquirer David Pilon, 8 Ardour Park, Sherwood, Fife FK9 3PT.

Problem I am searching my magazine (books issued) for getting the Dragon magazine plus back issues of Dragon User all 1983 and before, 1984-January-April-June. Can anyone help?

Enquirer Laurence Jacques.

Rue Péniche 40 05000 Namur Belgium.

Problem I can't get my Super Dragon Writer to drive a serial printer on my Dragon 32 via the serial port (Dragon Data Cartridge). Help please.

Enquirer Matthew Lodge, Mann Mann Holmes Chapel Road, Lich, Denes Northwich Cheshire CH85 7SL.

Problem Last Christmas I received a Touchmaster graphics pad. After a lot of work, I eventually got my Gamma DOS Cartridge to fit into the Touchmaster expansion port but to no avail.

When I use the multipoint program and try to execute graphics on disc I get an FD error (Directory Full). Please can anyone tell me how I save these graphics on my Gamma Disc Drive?

Enquirer Andrew J. Galloway, Holm Hall Cottage, Parole Lane, Mornings Hall, H. Mold, Flintshire CH7 5RH.

Problem Is it possible to link a Dragon 32 to a BBCB? Can anyone computer printer and use Dragon commands? **Enquirer** James P. O'Connell, 6 Colmore Crescent, Westonsuper-Mare, Avon BS20 4QA.

Communication

Stuck for a month? Need some obscure equipment? Feeling out of it? Four net — someone, somewhere, can help you. Write down your problem on the coupon below (make it as brief and legible as possible) together with your name and address, and send it to Communication, Dragon User, 12-13 Little Newport Street, London WC2E 7PP. We'll publish it as soon as we can — meanwhile, maybe there's someone you can help this month!

Problem: _____

Name: _____

Address: _____

THE NEW DE-LUXE TOP VALUE LIGHT PEN FOR THE DRAGON 32/64

THE NEW ADVANCED PROGRAM

for the Trojan light pen include the following facilities:

- * DRAW BOX
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- * DRAW LINE
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- * SAVE AND LOAD PICTURES TO AND FROM TAPE
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48 or 16K screen is any of 4 colours for the Dragon 32/64.

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Cornwall PL25 5JL

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   0726 68020



- * DATA ENTRY AND PROCESSING
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- * GAMES PLAYING

This is a first class program which gives hints and tips on how to write programs for the pen. Ideal for many educational uses.

A top quality pen plus a firstclass program.
The best value pen package available.

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Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, Dragon User, 12-13 Little Newport Street, London WC2H 9PR.

OS-9 Update

I HAD rather supposed in my reply by Paul Grady to my original letter about forming an OS-9 User Group as I had actually written to Paul explaining to him that I did not intend to set up a mail group to the DUG. Our group are purely concerned with OS-9, we are not trying to compete with any other group, but rather to fill a void for OS-9 users.

Since my letter in October we have successfully set up the group and we now produce a newsletter on Disk. The Newsletter supports a Public Domain Software library as well as the usual letters, articles, news and other items you would expect in a newsletter.

Our members are of all ages and come from many parts of the world with quite a number who are professionally involved in computing and are able to offer assistance to others. Our membership is mainly in the UK but we have two members in Belgium and three in Germany. We are hoping to introduce with the US User Group in the States and thus broadening both Groups software libraries.

Our Public Domain Software Library currently has six volumes (plus) compared with another half completed. Because we distribute the PDL programs on the Newsletter every month, our members are able to keep up to date with the PDL programs and discourses. It is very much more efficient for contributors coming in. We have some excellent routines which range from disassemblers to communications, file maintenance utilities and we also have a personal database, bibliography and one or two or three for any sort of column format.

Our membership is now at £10 per year which includes the price of the first disk. Thus members are asked to send in the disk by the 20th of the month for the next issue. We currently have three newletters (3 disk issues) and the 3rd Newsletter will be due at the end of February. If anyone is interested in joining us then they only have to send the some blank disks for copies of the Newsletter which will tell them

more about us than a single letter can (most postings would be appreciated).

I would like to thank Dragon User the Systems Engineers dept of Motorola in Scotland Tech-Ophical Consultants Drive Centre at Macclesfield, Cheshire, Tockmester and all the members who have helped me in various ways whilst I was starting the group.

Markus Vernon
4 Rossmore Court
Linslade
Gwynedd

Transform

THERE SEEM to be thousands of Dragon users transformed into ex-Dragon users by their transformers, but it is the users that do it what you should do:

- 1 Take your faulty transformer and a radio repair shop.
- 2 Tell them to open it up by drilling out the rivets (This is usually where the repair people get reluctant. I'll remember what have you got to lose?).
- 3 Let them replace the fuse that has blown most often the 12V one usually the actual transformer it is a burning state!
- 4 Let them close the box with screws, the next repair will be to much easier!

DON'T by the way unless you're a professional 240 volts is a killer. The whole job should take about half an hour and not cost more than £10. If anyone is looking for Swedish/Finnish word processing software or software to access and download from electronic mailboxes contact me!

Markus Vernon
Poundlands 4 2-14
St — 2000
Helsinki
Finland

MANY THANKS for all the letters on the subject of transformers — the signal is that they can be repaired BY PROFESSIONAL, COMPETENT PEOPLE. The mailing strongly advised against amateur meddling — a point that cannot be made strongly enough.

Of course, new or reconditioned transformers are available from a number of sources — Daley and Paskett is name but two

Wordproc Pokes

I HAVE had a couple of letters from people wishing to use my Wordproc program with a printer other than my Sokos GP100A. The alternatives are moderately simple.

Double = code for double width print
Single + = code for double width control or single width standard sized

POKE \$H1185 DOUBLE
POKE \$H1186 SINGLE
POKE \$H11C8 SINGLE
POKE \$H11C2 SINGLE
POKE \$H11C5 DOUBLE
POKE \$H11F7 DOUBLE
POKE \$H1178 SINGLE

The codes for double and normal text can be entered using the "special characters key" as described in the article. Double spaced lines can be obtained by first typing the program and then entering POKE \$H14A2 POKE \$H14B 13 POKE \$H14C 13. This will send an extra line feed to the printer each line.

Peter Whitaker
Cambridge

Tip Time

THIS IS the first letter that I have written to Dragon User to let the boy what a great job you're doing keeping the Site going 24-24 a day.

Dragon to Dragon

BELOW ARE some good ideas that cater for us Dragon users with modems. I'll let them with what I think are the best at the top and then in descending order.

Ring back (RIB) means that you dial the number and after it's rung once you replace the receiver and dial again. When you get the carrier tone turn your modem on and replace the receiver.

Name	Number	Details
WADDS (300)	0903 620711	RING BACK 24 HRS
BBSDS (300)	0703 736625	RIB WED & SAT 10PM SUN 10AM-10PM
DATA CRYSTAL	01 926 8247	DRAGON 300 OS 9
TUS 80325	021 444 1484	24 HRS (300 & 1200) SUN 10PM RIB 10PM-6AM NORMAL 24 HRS
SANCTUARY (300)		

I have come across a number of Poke a from Dragon world that might be of some use to the Dragon users who have not have access to a printer. POKE \$H188 \$H180 (enter)
POKE \$H189 \$H103 (enter)
POKE \$H187 \$H175 (enter). To cancel the routine type POKE \$H187 \$H03 (enter). To re-start type POKE \$H187 \$H7E (enter). What the routine does is that every time that a typewriter screen is sent to the printer (either via a typewriter).

Also I am looking for a computer person who would be interested at programming and also exchanging text files, programs, etc.

John Scofield
12 The Mount
Tegmorsch

More Tips

MY TIP is if you are Macrae and missing with machine code sometimes the program goes well and usually the DragonDoc that gets the word and at the stick. To get a back just send the file program.

10 CLEAR 800
20 FOR A=1 TO 10
30 READ 1 TO A AS B
40 PRINT 20 A AS B
50 NEXT

Mr F. Bailey (GARRP)
52 Phoenix St
Chase Terrace
South
W57 5JH

You need ensure that you modem is set in Dragon's Mode or else you'll get garbage on the screen.

All of the above numbers require your assistance to be set on. T. Dale Mooney (Step 8)

Ray Thomas
40 St. David's
Solihull
Haverfordwest
Dyfed
SA62 6T2

Dragon User People's Chart

This is what the Dragon world has been holding its breath for — the results of the first Dragon User People's Chart. The entries flooded in and the administrative masses were kept working long and hard until the results opposite were obtained.

Generally the programs submitted were of an amazingly high standard, but in the end we plumped for the total but unsure. The Dragon is just grist from D. J. Pate of Chalfonts, Bucks. North Devon. Many congratulations to him and his prize will be winging its way westward very soon. And so to final month.

Each month we will be asking you to vote for your top five favourite programs on your Dragon (games, applications or utilities) and write them down in order of excellence on the form opposite (or copy it out if you don't want to damage your issue). And just for an extra incentive (just if you need it) if you like you can construct a phrase or sentence using letters from the words in your own list — you don't have to use them all just as many as you can. We will pick out our favourite and the one who will be the recipient of this month's software donated by Microdeal. You can vote in the chart without making up an program, but you would be at with a chance of winning a prize.

Send off your entry to: People's Chart Dragon User 12-13 Little Newport Street London WC2H 7PP. Enter the People's Chart!

Results February 1986

- 1 Shocktrooper..... (Microdeal)
- 2 Juxtaposition..... (Wintersoft)
- 3 Speed Racer..... (Microdeal)
- 4 Eddie Steady Go..... (Incentive)
- 5 Jet Set Willy..... (Software Projects)

Chart Three

Voting for Chart No. 3 closes at 12.00 on Friday 18th April 1986. Entries received after that time will not be eligible for inclusion in that month's voting. The editor's decision is final. Only one entry per individual per month will be allowed.

My top 5 - Voting Month 3

- 1.....
- 2.....
- 3.....
- 4.....
- 5.....

Name.....

Address.....

My phrase is.....

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THE ADVENTURE OF THE

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Any Questions?

Construct your own personal expert system with this program from the keyboard of Peter Wittaker

IN THE Sytegi Expert program (Dragon User March 1986) I demonstrated how the Dragon could be made to appear to understand English and to draw conclusions from what it was told. However, understanding though that may be it is not of much practical use in the real world. The program here presented is different, in that it has great potential use, the extent of which is only limited by the imagination of the user. For example, if your car breaks down, it would be possible for the non-expert car-repairs-to-diagnose-the-fault in a mechanical world as using this program. The program would ask a series of questions, and depending on the answers given would be able to work out the fault. Similarly this program could help to diagnose an illness or to categorise an unrecognised animal.

Binary

Start by entering and running Listing 1. Dragsun. This is a short expert system which will illustrate some of the principles and restrictions of such systems. When run, it asks you to choose one of four possible causes for a car breakdown. Then it asks three relevant questions, and depending upon the answers makes its diagnosis. The program works by treating the series of answers given as a binary number (Yes = 1 No = 0) so that at the end of the sequence of questions we have a three bit binary value. This value is compared with the values required for the four known solutions to the problem. If a match is found it is printed out, and the program returns to the start again.

This works quite well, and although the program does not have any built-in ability to learn new solutions to the breakdown problem, it can be easily altered. If the questions are all answered "Yes" the program will reply that it does not know what the problem is. Edit Line 200 to add:

10000000 7 and change the loop in Line 156 from 4 to 5. The program will now come up with a solution to the situation. However, this is a very unsatisfactory solution because it is difficult to expand the program's knowledge database. Relative questions I can distinguish between eight different situations, but if we wish to add a ninth situation we must include an extra question. Complicated and change the answer values for all the other eight answers (there drive bit values to four bits), and the database values will need to be recoded (twice).

This might not be too much trouble with three questions and eight situations, but by the time you have reached 10 questions

```
10 10000000 PRINT "WELCOME TO DRAGSUN"
11 10000000 PRINT "WHAT IS THE PROBLEM?"
12 10000000 PRINT "PLEASE CHOOSE A FROM
13 10000000 PRINT "FROM ONE OF THE FOLLOWING:
14 10000000 PRINT "1. FLAT BATTERY"
15 10000000 PRINT "2. EMPTY PETROL TANK"
16 10000000 PRINT "3. BROKEN HEADLIGHT"
17 10000000 PRINT "4. BLOWN FUSE"
18 10000000 PRINT
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Listing 1

and over a thousand different situations the job gets out of hand. A second problem is that to find a solution, the program needs to ask all of the questions it knows, even if some of them are totally irrelevant. Added to this many of the possible answer combinations will never occur so 10 questions might only distinguish between 20 actual solutions, and not the thousand possibilities. All of this makes the program very rigid, uninteresting to use and removes all

chances of a short cut to the solution.

Listing 42, the Expert Learning System, overcomes these problems. Instead of relying upon rigid rules for all the questions asked, it generates a tree of related questions and answers. This means that it will ask only the minimum of possible questions to arrive at a solution and that it can very easily learn and expand its knowledge database. The program makes use of three data tables. The first

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POCKETMONEY SOFTWARE
MODEM HOUSE
INCENTIVE
TANDY CORPORATION
COMPUSCENCE

TROJAN
MICRODEAL
SALAMANDER

Show Times Sat 10.00 a.m. — 6.00 p.m.
Sun 10.30 a.m. — 5.00 p.m.

LECTURES (both days)
11.00 am 1.00 pm 3.00 pm
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Post Code

I enclose a cheque *please debit my credit card no* (*delete as applicable)

**RETURN TO THE ORGANISER, 6809 CONVENTION,
P.O. BOX 68 St. AUSTELL CORNWALL PL25 4YB TEL 0728 68000**


```

430
440 IF ANSWER EQ THEN GOTO500
450 IF ANSWER THEN PRINT YES GOTO500
460 IF ANSWER THEN PRINT NO GOTO500
470 GOTO500
480 PRINT ARE THE OUTCOME OF THE P
OUTCOMES GOOD FOR BUSINESS? CHA
490
500 PRINT ARE YOU THEN 500
510 IF YES THEN PRINT YES GOTO500
520 IF ANSWER THEN PRINT NO GOTO500
530 GOTO500
540 IF ANSWER THEN GOTO500
550 IF ANSWER THEN PRINT QUESTION A
560 GOTO500
570 IF ANSWER THEN PRINT QUESTION A
580 GOTO500
590 IF ANSWER THEN PRINT QUESTION A
600 GOTO500
610 IF ANSWER THEN PRINT QUESTION A
620 GOTO500
630 IF ANSWER THEN PRINT QUESTION A
640 GOTO500
650 IF ANSWER THEN PRINT QUESTION A
660 GOTO500
670 IF ANSWER THEN PRINT QUESTION A
680 GOTO500
690 IF ANSWER THEN PRINT QUESTION A
700 GOTO500
710 IF ANSWER THEN PRINT QUESTION A
720 GOTO500
730 IF ANSWER THEN PRINT QUESTION A
740 GOTO500
750 IF ANSWER THEN PRINT QUESTION A
760 GOTO500
770 IF ANSWER THEN PRINT QUESTION A
780 GOTO500
790 IF ANSWER THEN PRINT QUESTION A
800 GOTO500
810 IF ANSWER THEN PRINT QUESTION A
820 GOTO500
830 IF ANSWER THEN PRINT QUESTION A
840 GOTO500
850 IF ANSWER THEN PRINT QUESTION A
860 GOTO500
870 IF ANSWER THEN PRINT QUESTION A
880 GOTO500
890 IF ANSWER THEN PRINT QUESTION A
900 GOTO500
910 IF ANSWER THEN PRINT QUESTION A
920 GOTO500
930 IF ANSWER THEN PRINT QUESTION A
940 GOTO500
950 IF ANSWER THEN PRINT QUESTION A
960 GOTO500
970 IF ANSWER THEN PRINT QUESTION A
980 GOTO500
990 IF ANSWER THEN PRINT QUESTION A
1000 GOTO500

```

```

710 R=0
720 PRINTFILES,INITIALQUESTIONS
730 GOTO 1
740 IF ANSWER(A)="" THEN PRINT QUESTION
750 A=A+1:GOTO 500
760 PRINTFILES,ANSWER(A)
770 PRINTFILES,ANSWER(A)
780 PRINTFILES,QUESTION(A)
790 PRINTFILES,ANSWER(A)
800 GOTO 700
810 PRINT "HANDLE SAVED." GOTO 8
820 GOTO 1 AND NOTGOTO 800
830 PRINT "ENTER FILE NAME, PLEASE"
840 PRINTFILES,INITIALQUESTIONS
850 GOTO 1
860 PRINTFILES,ANSWER(A)
870 PRINTFILES,QUESTION(A)
880 PRINTFILES,ANSWER(A)
890 PRINTFILES,QUESTION(A)
900 IF ANSWER(A)="" THEN GOTO 700
910 GOTO 1
920 PRINT
930 GOTO 1
940 A=A+1:IF ANSWER(A)="" THEN GOTO 700
950 ELSE ANSWER=A
960 GOTO 1
970 FOR A=1 TO 2000:NEXT A:RETURN
980 END
990 END

```

Original Software for the Dragon by COMPUTERWARE

[illegible]

^aComputers were present; the question in article shared commonality with '—Do you have any?'.



100

¹⁴Uniford seems to be an excellent program, with much emphasis on the best interests of . . . — *Dragon Quest*, May 1995



1000

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

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¹⁰⁰ "... a well written and thought out program" — *Register*, 11/10/85

[illegible]

COMPUTERWARE

DOI: 10.1002/for

NAME AND DESCRIPTION

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I have this morning received
my copy of Spacemaker Quid
and am very pleased with it.
I must praise your very
service well done
Paul Gardner
Houston

Dear Computerized
May I say how successful your
Lunkhead program is. It has
given our family hours of fun
and interest — and I hope
increased our vocabulary!
Peter Jewess
Rye

TRAVEL ENJOYERS WELCOME

Getting in control

The new MXT controller opens up a new range of applications for your Dragon — Roy Coster checks it out

THE LATEST addition to Compuserve's armoury of hardware for the Dragon is the MXT controller cartridge from Ilexon Electronics. The cartridge fits snugly into the Dragon's cartridge port and has integral legs to support the weight of the unit when it's easier than most cartridges owing to the weight of the relays that are activated within it.

The facilities offered by the cartridge include the ability to control up to four external devices (the controller is available in both 2 and 4 relay configurations) and to detect the condition of four input channels. A real time clock incorporated in the package will enable you to write software programs to operate at set times which makes it suitable for many domestic applications such as heating control and lighting etc.

When the unit is plugged into the Dragon and the Dragon switched on the program held on an EPROM within the cartridge automatically adds seven time commands to BASIC to enable the unit to be controlled

easily from a BASIC program. The new commands allow you to set the real time clock, access the clock (for timing purposes), switch on/off the relays either ON or OFF and determine the status of each of the four input channels.

The commands are: **CLOCKSET** — Which allows the real time clock to be set to the current time.

CLOCKCHK — Which displays the current setting held by the real time clock.

CLOCK — Which allows a BASIC variable to examine the values held by the clock.

SWITCHON — Which allows one of the relays to be energised.

SWITCHOFF — Which will de-energise an active relay.

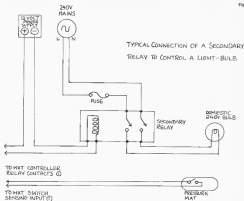
SWITCHIN — Which will return the status of a selected input port.

MON — Which activates the monitor program built into the cartridge. The machine code monitor built into the MXT and later allows the assembler programmer to examine and de-bug his prog-

rams while the controller is present. The monitor is capable of examining and changing both the 5589's internal registers and user specified memory locations, setting breakpoints to allow machine code program execution to be monitored at selected points, execution of a machine code program (soft) and finally a warm-start back to BASIC.

As with the added BASIC functions, the monitor commands are simple to use and easy to remember. The documentation supplied with the unit gives sufficient information on each of the new commands and some useful ideas and examples on how to implement them.

Carter has obviously been taking in designing this and for although the makers suggest that the clock should be accurate to within about two seconds a day, they give information on how using the counters that control the clock itself. These counters are employed and the most sensitive of these will alter the clock rate by a mere 0.1



seconds a day" (Apparentity Dragon Data changed the main Crystal frequency in some of the earlier Dragons from 14.218MHz to 14.21818MHz, details for adjusting the clock to compensate for this are also given).

Connections to the MKT unit are made by means of some very neat screwless terminals, these simply require a screwdriver to depress the spring-loaded assembly whilst the wire is inserted and this provides a secure connection to the cable.

Relays

The relays used in this controller are rated up to a maximum of 3 Amps at 240 Volts AC and a maximum of 3 Amps at 240 Volts DC and it is worth remembering that the manufacturers strongly recommend that mains voltages should not be switched by

the relays in the unit but by secondary external relays driven by passing a lower voltage through the relays in the MKT unit.

The MKT controller unit may be used for all sorts of applications from a simple burglar alarm system to the control of a model railway. A useful application would be the automatic switching on of a house light at a set time in the evening. (See Pg 1). The following program will switch a light on at 6pm (1800 hrs) and switch it off at 11pm (2300 hrs). The switching on of the lamp may be overridden by a pressure mat connected to input switch 1.

A burglar alarm circuit may be made up in such a way that all trigger switches are connected in series to one of the input sensors and the alarm bell triggered by a secondary relay driven from one of the MKT relays.

The user to which this unit may be put are so varied that it would be impossible to list them all. It is well made and the price compares fairly with other such products on the market. The software is simple to use and the unit appears to be quite reliable. The only reservation that I would have personally is that the power to drive multiple relay operations may, in the long term, be too much for the Dragon's already weak power switch.

Product MKT controller
Micro Dragon 32
Price 2-relay £29.95 4-relay
£35.00
Distributor Computech Ltd, PO Box
166, 2860 Green Lane, London
NW2 6XA, Tel. 01-852 0681

```

10 REM PROGRAM TO SWITCH LIGHT ON AT 6PM AND OFF AT 11PM.
20 REM
30 REM
40 T=CLOCK(H)
50 IF T = 18 THEN 40 : CHECK FOR 6PM.
55 IF SWITCHIN 1 = 0 THEN 40 : IF NOT 6PM THEN TRY AGAIN.
60 SWITCHON 1 : PRESSURE MAT OPERATED ??
70 REM NOW CHECK FOR 11PM TO TURN THE LIGHT OFF.
80 T=CLOCK(H)
90 IF T > 23 THEN 70 : ACTIVATE RELAY ONE.
100 SWITCHOFF 1 : NOT 11PM SO TRY AGAIN.
110 END : 11PM SO SWITCH RELAY ONE OFF.

```

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```

10 PROBE 3,1:SCREEN 1,0
20 DIM G(40,8)
30 A=1536
40 FOR N=1 TO 8
50 READ G:POKE A,G
60 A=A+32
70 NEXT N
80 IF A>1537 THEN 120
90 A=1537
100 GOTO 40
110 DATA 255,255,00,255,00,00,255,
00,255,00,00,00,00,00,255
120 GET G:G= -G,0,5,G
130 POKE
140 COLOR2
150 LINE 0,141 - 1256,141,1:PSET
160 FOR Y=57 TO 57 STEP 8
170 FOR X=2 TO 198 STEP 8
180 GOSUB 499
190 NEXT X
200 NEXT Y
210 FOR Y=63 TO 79 STEP 8
220 FOR X=2 TO 198 STEP 8
230 GOSUB 499
240 NEXT X
250 NEXT Y
260 FOR Y=86 TO 183 STEP 8
270 FOR X=2 TO 198 STEP 8
280 GOSUB 499
290 NEXT X:NEXT Y
300 FOR Y=196 TO 127 STEP 8
310 FOR X=2 TO 66 STEP 8
320 GOSUB 499
330 NEXT X:NEXT Y
340 FOR Y=134 TO 143 STEP 8
350 FOR X=2 TO 198 STEP 8
360 GOSUB 499
370 NEXT X:NEXT Y
380 FOR Y=178 TO 194 STEPS
390 FOR X=2 TO 198 STEP 8
400 GOSUB 499
410 NEXT X:NEXT Y
420 N=69:FOR Y=150 TO 174 STEP 8
430 GOSUB 499:NEXT Y
440 COLOR3
450 LINE 0,153 - 1256,194,1:PSET,0
460 LINE 0,143 - 1253,192,1:PSET,0
470 COLOR4:LINE 119,57 - 1266,194,
PSET,8F
480 GOTO 400
490 PUT G,X,Y - G+8,Y+8,5:PSET
500 RETURN
510 GOTO 510

```

Listing 2

```

20000 15405900000000000000000000 = 10F
20011 000000000000000000000000 = 00
20022 1010101010101010101000 = 05
20033 400040001000000001000100 = 00
20044 0100010001000100010001 = 0
20055 4001000400101000100040 = F5
20066 0100000010001000100000 = 8F
20077 401010101000100100100040 = 112
20088 00101010101000500100010 = 85
20099 0010001100110011001150 = 00
20110 0100010001001001500100010 = 00
20121 00100001500155000100010 = 0A
20132 0010150005001500101010 = 13F
20143 0015001500101010101500 = 15F
20154 0500155015500010004001 = 100
20165 4001000400040010001000 = 69
20176 050005001010101010050005 = 114
20187 4010101010005000500500 = 14F
20198 0500101010100050005000 = 12F
20209 100010005000500050005000 = 144
20220 1000100005000500050000 = 0A
20231 101040050005000500050010 = 164
20242 1000100010001000101000 = 60
20253 00004000400040010101010 = 15F
20264 101010101010101010050005 = 0A
20275 40004000400101010101500 = 15F
20286 1500110010001000101000 = 130
20297 000550100010001000150010 = 16F
20308 100010000500050005000000 = 10A
20319 000000000000000000200020 = 200
20320 0020000000A02A000A000A = 3F2
20341 00000000000A000000000000 = 32
20352 00002000000000000002000 = 20C
20363 20200000000000000002000 = 206
20374 020000000000000000000000 = 400
20385 000000000000000000000000 = 504
20396 20002000000000020000 = 390
20407 0000200020000020000000 = 304
20418 00000000000000000010000 = 54
20429 001000000000000000000000 = F8
20440 400050000000000000000000 = 114
20451 000000000000000000000000 = 00
20462 400040004000500050004000 = 100
20473 0000000000000000010004000 = 54
20484 500040004000000000000000 = 0C
20495 000000000000000000005000 = 54
20506 100010001000100000000000 = 40
20517 1000007000007000001000 = 100
20528 0040000100007F0000700 = 254
20539 0000102000000000100070 = 259
20550 00000000000000000020000 = 00C
20561 0004000010000010000000 = 42
20572 0000010000070000070002 = 179

```

Listing 4 - end on p11

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& TANDY COLOUR

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 220446 C684F74E28A8E4E263818F = 479
 220557 4E2635863436C88458E784 = 4E7
 220668 358888888C317F8D18E882C = 58F
 220779 868FC61D188E518F88D518F = 4E3
 220888 F68E38C184278888853238A = 38C
 221001 26F88E4E2638888288F4E26 = 488
 221112 868FC61D188E582488D518F = 457
 221223 4F8788888884E2E8C6143D8C = 478
 221334 4E281F82888888888888C61E = 385
 221445 8881D888F87FF8817814A = 57F
 221556 86858C818D1827828888881 = 326
 221667 84FF88288D1782888884E2D = 324
 221778 81811827FFF1C88558888181 = 366
 221889 368D18FC8E8888112818F18 = 38F
 222000 37FF888888128881588138 = 443
 222111 18238888818C18238888888 = 38E
 222222 8188818128428138228D18 = 23E
 222333 F888888812F78883F8588A = 58A
 222444 C1813728F84E28AC1842786 = 367
 222555 8D88E88A26F81888888288E = 53C
 222666 4E26864FC6188D518F8C681 = 488
 222777 F758488D52288881875885 = 414
 222888 87588818FF78888812F885 = 536
 222999 88C1812738FF7888884F84E = 483
 223108 38C184278888852388A28A = 388
 223211 8E4E26188E5851864F8C61D = 389
 223322 8D518FC841F7588888D58E = 585
 223433 C681F75884F7588716FF37 = 488
 223544 188C582426428635858181 = 386

223655 2611888E38818427888882 = 328
 223766 238826F88F87888817F8E5 = 4E6
 223887 16FF13188C8882823C8855 = 38D
 223998 8881813611884E28818427 = 298
 224089 868852234826F8AF875888 = 445
 224208 17FF8F716FF8F8658888181 = 541
 224331 2611864E28818427888855 = 329
 224442 584A26F8AF87588817F8AD = 562
 224553 16FF818635878181261186 = 466
 224664 4E28818427888888888888 = 38C
 224775 F8AF87888717F88816F8E8 = 5F2
 224886 343888E4E263888888888888 = 37D
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 225441 88888F884848888888263586 = 444
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 225885 88271788824788821884E28 = 10C
 225996 81888888C681F74E28888E = 3E7
 226087 261888518F868FC6188881 = 528
 226198 8F88818778888888883434F6 = 444
 226299 8E28C18827178881888188 = 318
 226408 228888888888A28F8818C28 = 476
 226519 888852235826F88F4E2618 = 3F4
 226622 88888C8F8888888888888888 = 42E
 226733 882888888888888888888888 = 465
 226844 188C888826E717F8F43588 = 488
 226955 343888E4E26888158812823 = 378
 227066 3C3418888888888888888888 = 41C
 227177 818827828D7588FFA78888 = 48C
 227288 1F8A24EF17881235188888 = 288
 227399 88F8C884F87888881F8826 = 612
 227508 F88888888888888888888888 = 56F
 227611 FF2388888188F887F8288D = 597
 227722 167FFF288D11388818C888C = 34E
 227833 28E888FF2388F787FF2385 = 678
 227944 861F12313F26FC89188E251 = 3A1
 228055 85868FC61888518F8D52CA = 523
 228166 188E518F8D518F8C68A17F8 = 52D
 228277 C15826F888588C8887588C = 486
 228388 26383436888888188261E8C = 3A8
 228499 18542288888872388888C16 = 323
 228608 2C2288881448288888C19C1 = 383
 228711 27888E19C12888388888F87 = 457
 228822 584C8E4E26878887888788 = 4E1
 228933 8648874E2838788888874E = 38C
 229044 2C38388878888888888888 = 469

Heart of the matter

This month Messrs Orbaum and Campbell reveal the joys of chip architecture and flowcharting in part two of our series on machine code

LAST MONTH we showed you a small glimpse of the world of assembler programming. Before we start programming however, there are a few more things that form the basis of the programmer's world. Two in particular are processor architecture and flowcharting — in that order.

Processor architecture has nothing at all to do with Sir Christopher Wren, but then again it has very little to do with programming. It is, however, handy to know in mind the way the processor deals with the instructions that it is carrying, so this way more efficient code can be written.

Registers

The diagram in Figure One shows the internal structure of the 68000, giving the relationships of all the registers and bus-ess. The easiest way to think of a register is as another memory location. The same difference is that of speed — to access the contents of a register, the processor does not need to go outside the immediate environment. The registers all have different uses, as listed below:

PC — Program Counter: Used to point to the next instruction to be executed, and therefore 16 bits wide. Very rarely is this used by programmers. Although it is possible to change the contents, the results are tricky to control, and the desired result can usually be achieved in simpler and easier ways.

SP — System Stack Pointer: A stack is a lot of bytes used for many purposes. The analogy of a stack of plates has been quoted in many other places, and is not strictly true, as the stack pointer can be changed to access bytes out of sequence. This pointer contains the address of the next free byte on the stack, and is updated whenever something is pushed to, or popped from the stack. The system stack is used, as its name suggests, to store return addresses for subroutine calls. As the stack can be placed anywhere in memory, this register is sixteen bits wide.

US — User Stack Pointer: The 68000 is unusual amongst processors in that it has two stacks. The user stack is not used by the processor, and so it is safe to use the user stack for all your data. When anything is left on the stack by a subroutine — normally data when it comes to time to relieve the return address — the program runs at right. On the other hand, if this process is followed, the first indication that something is wrong comes when the stack has grown far enough to contain something important. On the whole we generally

ignore the user stack, but it can be useful on occasion.

X and Y — Index Registers: Like all processors, the 68000 has several index registers for use in accessing memory. Unlike most, both indices on the 68000 can access the entire range of addressable memory — at 16M, it is limited. This is because they are 16 bit registers. They are used as an offset for accessing, for example, tables of data, but they have many other uses, as we shall cover later.

DP — The Direct Page Register: Memory is divided, normally, into pages of 256 bytes. For speed, it is possible to specify which page operations are going to occur in, and then adjust the address as an eight bit offset within this page. This is only really useful if there are going to be a large number of memory operations within a 256

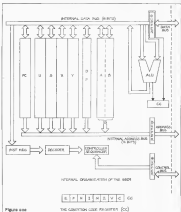
byte area — for example sorting a small data table.

D0 — The Accumulator: The stack is also unusual in that it has a 16 bit accumulator. This is the register that is used for most of the arithmetic functions. It can also be used as two eight bit registers, A and B, for functions not exceeding 256.

CC — The Condition Code Register: This is best thought of as eight separate bits, as they are rarely accessed as a byte. Each bit serves a different function, mostly used as a flag to show whether or not an event has occurred. We will deal with these separately as we come to them.

Many of these explanations will only become clear when addressing modes are covered at a later date.

The ALU is the Arithmetic Logic Unit, and executes arithmetic functions such as add-



for subtraction, and, surprisingly, multiplication a function that normally needs implementing in software.

The data and address buses are both used for communication between various parts of the chip and, through slaves, with devices such as memory chips.

The computer sequencer is the bit that controls all the registers and the ALU with help from the instruction register and the decoder.

Now on to a subject that has made grown men sane, and is widely agreed by

programmers analysts consultants and bus drivers, despite its relative importance. This is flowcharting! Many people think this is only of use for very large programs (all with a language like assembler where there are a large number of lines of code, a matter very easy to lose track of the overall direction of the program, when concentrating on one line at a time). These flowcharts come in handy. There are a multitude of symbols, courtesy of the boys at the BCL, but of these, only three are of any use — Process, Decision and Start/Stop.

The basic principles of flowcharting are very simple. The most important thing is to be able to look at whatever is being coded as a whole then break it down into manageable chunks in logical sequence. What a manageable size is depends on many things including the size of the whole task, the programmer, the size of the finished flowchart.

The only guide it is possible to give is to say that the flowchart itself should not get out of hand.

The symbols are as follows:

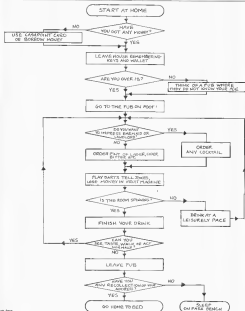
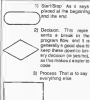


Figure 100



Figures Two and Three are two flowcharts we drew up as an example. The first, not totally serious, has nothing at all to do with programming (except in that it represents a process, not totally unfamiliar to most programmers), but should serve as a general example. The second is a flowchart for a program we will publish next month to clear the screen in a slightly different way. More on that later after a closer look at Figure Two.

Flowcharting

The first thing you will notice about the flowchart is that it's very easy to follow. This is one of the fundamental advantages to flowcharting a program. It is very difficult to get lost in the programming provided you have an adequate flowchart read to you.

We say adequate because we have seen someone try to write a DragonBox program from a flowchart with no boxes, which were "Show Instructions, Initiate Play Game, Is Man Dead? (Y/N), Print Game Over, and Another Game? (Y/N)." This flowchart alone can imagine is of little use to anyone.

The thinking flowchart can save a lot of time spent for processes, a state, and two alternative endings. All lines are arrowed (some more than once), all junctions have arrows at all times ending junction as near to the junction as possible without causing confusion. All decision boxes have their exits clearly marked "Yes" and "No."

All these things should be present on every flowchart, although on a code flow chart the start and end boxes should contain the words START and END respectively and exclusively. Study the first flowchart understanding it and use them go on to Figure Three. Look at it and try to understand it before reading on for the explanation.

Right, all those who didn't even glance at the diagram go back and do it again. Does that? Good. Now the flowchart is very simple. Having two loops, but it may still be understandable to notice that the Dragon first starts at initial location 1024 and ends at location 1028. All the routine does is to point to a position along machine memory at the right hand end, store the address at the position X (in this case the R register), and then use this as an offset to store a green square on screen. The pointer is then

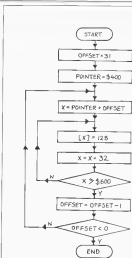


Figure Three

moved on to the next line by adding 32, and the register is checked to ensure we have not reached the end of the screen. If we have the position is reduced by one, and if we have not reached the end of the line the process is repeated.

Glossary

Try to extend the flowchart so that it clears the screen in black that way, and then does the same in the opposite direction, in green. We will present a program next month that does so.

For now here are this month's additions to the Glossary of machine code terms.

Accumulator — A register within which most of the mathematical functions are performed without a machine code program.

FLD — **Fetch in Last Out.**

Flowchart — A diagram designed to ease programming of part or all of a program. The flowchart consists of a series of standard symbols contained in a manner that makes them easily understood.

LLO — **Last in Last Out.**

Register — In code terms, a register variable within a computer. A set of eight or 16 bits (defining a register as a one or two byte register) used for the manipulation of data within memory.

Stack — A pile of numbers. A stack works on a LIFO principle, i.e. the top number on the stack will be the one put there most recently.

Join us next month for the first piece of actual code.



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Micro Vision is a new company dedicated to supporting the Dragon and the users of any other Dragon compatible hardware.

Dragon Answers

Over Loading

PLEASE could you tell me if it is possible to load a graphics screen into another graphics screen using the first screen graphics on the other the second screen. If you could help I would be most grateful.

Duncan Chambers
35 Park Avenue
South Shields
Tyne & Wear



THE SIMPLEST method of loading one screen over another, without resorting to machine code, is to use a program such as the one shown below. Basically this loads one picture into the first four graphics pages, and the second into the next four pages. The RET command is used to take a section of the picture from the second screen and store it in the area A.

The RET command is then used to overlay this on to the picture on the first screen.

This method works fine in the two colour modes, but for two colour modes change the "AND" in line 70 to "OR". The space where colours overlap will give interesting effects.

10 PICTURE 1
20 PICTURE 2, 3 SCREEN 1, 1
COLOR 0, 1 PICS
30 CLORIN "PICTURE" ROM
Load station — saved by the
COMIN "PICTURE" ROM,
70700 command
40 PICTURE 3, 4
50 CLORIN "PICTURE", ROM
ROM Load at offset
60 ORIN A(128) ORIN 0 — (256
190, 0, 0
70 PICTURE 4, 1 PICS 0 — (256,
190, 1) AND
80 GOTO 10

Remote Control

I AM trying to write a machine code program to enable my Dragon 25 to be run entirely from a ROM cartridge. The terminal has a 1024 x 24 display and I would like to take advantage of this.

I have a Major 16232 port and have run a small program from ROM to check that the terminal will communicate with my Dragon.

can I need to know where to place the code of the received character so that the Dragon thinks it is an input from its own keyboard, and also how to copy the output to the screen to the terminal. Hope you can help.

D. Foxall
103 Wilby Road
West Stock
Widnes
Cheshire WA9 6DT

IT SHOULD certainly be possible to use a Dragon from a remote terminal. One first has to get the vectors of 255 and 256 which are the links for character input and output respectively. These are normally indicated in ROM instructions. Use the Program page in DR 11-100 and 11-101 for details of how to patch these routines.

Multi Channel

FOR A while now I have been struggling with multi-stored sound output (ie. Composer) via my Dragon's D/A converter. Although I can quite easily produce single through one channel I can find no way of outputting through more than that. Could you please help me with this problem?

Adam Lee
24 Fernington Road
Gillingham
Kent
Gillingham SE13 6AT

A FORM must be used by Dragon-Books in the input's sound capabilities (or lack of them). The Dragon has only one hardware sound channel. One sampling single bit signal which is injected into the D/A converter. Programs such as RBC

replaces "Composer" use a software to simulate two-channel digital sound conversions from the D/A — each "channel" has a different waveform. The second one only comes from one channel but appears to be in phase with the other.

The technique involved enables complex and the simplest solution is to use a copy of "Composer" which, after all will produce stereo sound machine code.

Type Writing

PLEASE could you tell me if there is a way of getting whatever is produced on the screen also produced on the printer without having to use P-2 in every print command. For example, the one in program below.

10 PRINT "Dragon 25"
20 GOTO 10

I am asking this because at school I am taking a computer studies course when I have to produce the programs written in BASIC in the period of time-years that the program has to be produced as a book and also as a ROM copy on the printer.

Please could you tell me how whether there is a solution to my problem.

Neil Post
12 Weston Close
Liphid
Lancs PR8 3TG

THE FOLLOWING sheet listing can be run prior to loading your programs, or added to the end of any of them. It causes a character sent to the screen to be echoed to the printer as well as the screen. You can still send characters to the printer only by using PRINT

-2 as normal. The program can be started by typing PORE 254,0.

10 CLEAR 256-255
20 FOR I=0 TO 2 READ A,PORE
2550-11 A, NEXT
30 DATA 10,11,30,1,50,100,
100,20
40 PORE 100,100 PORE 200,
100 PORE 300,100

Making Contact

I OWN two Dragon 84s which I have linked together via the RS 232 ports of 1 for following only. Pin 1 to 1, Pin 2 to 6, Pin 3 to 3, Pin 4 to 4, Pin 5 to 2, and Pin 7 to 7.

Finally could you let me know if these are correct and accurately could you please tell me how to send programs and data from one computer to the other as the DLOAD command only sets one computer to receive. I have tried the small programs given in the Dragon 84 supplement with no success.

M. P. C. Rouse
1 Morris Hall
Gerrards Green
Dough
S23 6LQ

A Satisfactory lead for connecting two 84s together can be made by connecting the pins in the following way: Pin 1 to 1, Pin 2 to 4, Pin 3 to 5, Pin 4 to 3, Pin 5 to 2.

The problem with the Dragon command is, as you have found, that in its equivalent COME command. The format required is not simple and to generate it is best to write a program in BASIC. A lead made up as suggested above, the example program in the supplement should work and use from the back of a more sophisticated communications program.

Whoops!

FINALLY, I have received a number of letters regarding my answer to John Smith in DR AG 70. Many letters asked me to give in using the variable PORE to load the disk ROMs. This should have come read P1 or P2. It is reserved now in Dragon BASIC and so the use as part of a variable name will cause a syntax error — sorry!



LET'S GOAL with some readers letters first before going on to some news which I know will interest lots of people who have written in to me in the past.

First put all the busy days in *A Degree of 11* (Stony Street, London E14 4GB) who offers help to anyone at all in *Trickfoot* and *Jurassicpark* but in return needs a favour himself or possibly herself! DO has bought one of the *Phorce* two-pack games, where you have to discover a code from playing an arcade game before being allowed to play the adventure on the second tape. I never liked this approach and DO has been unable to get it through the arcade game, leaving an unsolvable adventure. The pack was called *The Emperor Must Die*, so can any of you code crackers at arcade addicts out there come to the rescue?

Operation Salfras

Many of you have completed *Pedgrew's Diary* (but as yet no one has claimed to have got through the second part *Operation Salfras*). After answering all the questions on the note given to you by *Reynolds* (says Justin Field) what is the code you have to enter to proceed? Any help to me or to Justin at 2 Barnes Green, Hatfield, Doncaster, South Yorks DN7 4RL.

Help of a slightly different kind is needed by *R J Duffell* 39 Meadow Avenue, Hedge Hill, Birmingham B26 8HQ. It may well be psychic help as the *Gambler* household thinks the *Adventure Trail* should be five pages long every month, but the real problem lies with *Pauline's Tomb*. The *BAW* facing on their copy causes the program to crash, which I think I have anyone mention before. Has any reader encountered the same problem and found a way round it? (I think you've finished the game and would like to play a copy on The Gambler will manage to annoy themselves in the meantime as they're stuck in *St Gallen*, but who on it? How to get to the cave in the cliff, and how to get the leather from the eagle they ask. Well to security favourite *Gwilyr* Brothers song *MAJOR DODD DOTE WARDU YLLA*.

To prove that adventure playing can definitely be a family activity just consider the Higgins home in *Boots*. *Mrs. Mary* Phillips asking about *Pedgrew*, *Franklin* and *St Gallen* while her brother is stuck in *Wings of War* and Dad has shown what is a

change for just completing *Return of the Ring*. He failed a bag in the program, so after managing to kill Gort, the program crashed whenever he tried to enter a village. Could be Gort's revenge, I suspect, being dealt out by his brother, Gorf. Anyway Higgins' season's advice is to forget Gort and take your gear to the Chamber of Time to get into the final stages which is a mini-adventure with brilliant graphics.

Jurassicpark is the adventure that's dominating the passing of the months, not surprisingly with detailed customer service — both those who've solved it and those who are struggling but still asking it. You'll probably know already that *Dragon* sells the newspapers that the sequel might be ready by Easter. Maybe *Dean Douglas* of *Blackburn* will have crossed the Blue Mountains by then. The way through is in the *Brown Leeds* *TPAH* *SAM* CODE R/R AYD. A hint on the game from *Frederick Jowett* of *Burnley* who's solved it and *Trickfoot* both of which he thought were excellent though he says *Trickfoot* didn't have as much behind it as he expected. Anyway, in *Jurassicpark* *Frederick* says that while you're outside the *White City* (I thought that was a dog track) you should enter any building you can see, no matter how something interesting.

Franklin

Carl Thum is trying to find something interesting, and that's a copy of *Franklin* in *Wonderland*. You may recall the *Summer* got released a version of this without any and/or nations he'd never had time to have disappeared from the market, as instead those *Summer* *Myriad* are getting some of the former *Summer* titles but not the new. Anyone with a spare contact Carl at 11 Haydon Road, Puddfoot, Northants NN10 5HR.

Stephen Cogan of 574 King Lane, Alcester, Leics LE17 7AH is keen on hearing from *Dragon* owners in the Leeds area, particularly adventure players to see about setting up a club of some kind or contact Stephen if you're interested.

I'd like to remind readers to enclose their address when writing (which M D Waller does) so his offer of help to people on several adventures is rather difficult to pass up. So was the answer to his question (a *Summer* one line) about getting just the

High Eye Droid in *Jurassicpark*. You need a flash of inspiration on that one.

Help on *Jurassicpark* is available from *Gareth* and *Gemma Edwards*, and you don't need to be an adventure to work out where they live. The address is 10 Hatched Court, Handersley, Cusworth, Mid. Gearingham CF4 2TR. The brothers offered any (or all) advice saving others to a desired position if you like, or just help on any particular problem (provided you endorse the advice of course) upon when writing to anyone who's kind enough to offer help to other readers. *Gareth* and *Gemma* completed the game in 12 days, and two of those were spent trying to solve the puzzle of the creature, which I would have thought was one of the easiest of the lot, so it goes to show how different puzzles affect different people.

If you're bored in *Ring of Darkness* then some hints from *Garrick Acker*. He says that if you're thinking of buying a rifle go for the standard, well you can afford to buy less. I bet just one or each share in case you don't are recommended on the opposite side from where you left the rifle. That's a rule you can't afford a *homestead*. *Garrick* also recommends the coward's way out in trying to deal with the monsters in the dungeons — break into the program and add their strength to that. Have my readers noticed that?

More honest advice on *Return of the Ring* comes from *Jonathan Harrop* of *Wantage*, who says that as the user you must continually kill monsters to gain experience and raise your *Garrick Level*, which raises the shops to sell more equipment, including the pieces that you need. Also by hiding with the monsters in the Forest Moon as some of them give crystals handy for nothing.

A couple of months ago I reviewed an adventure called *Castle Blackstar* and rated it very highly indeed. A little grumpy about me, the reviewer who publishes *SGR Adventures* have asked me to mention, and that's that the disc version is only available for the 644K *Dragon*, and not its little brother. It's good to know that at least one reader shares my enthusiasm for *Castle Blackstar*, and that's *Pauline* *Hempson* of 10 Cherry Lane, Leamton Spa, Alcester, Leics CV35 9TF. *Pauline's* completed lots of adventures so knows what she's talking about, and she says the *SGR* effort really

is incredibly good!" So good that when stuck and needs help, can the reader who told me about the adventure and where-to-look? I can't find help! Please, is it any way? Or anyone else for that matter.

How for themselves that I mentioned, which should please all those readers who have written all over the months, asking if there is any hope of a tape version of *Colossal Cave Adventure* for the Dragon. Well at last I have it. Although it's a tape, it has a little bit of adventure just a little further to go. It's in the 20th. At least you'll be able to discover for yourself what everyone on virtually every other issue has known for ages — that *Colossal Cave Adventure* is the granddaddy of all adventures.

The adventure remains the same — you go into the genuinely colossal underground cave network and retrieve the various treasures that are hidden in there. Getting into the cave isn't much of a problem, but map-making is essential if you're to find your way round and also get out again — that's once you've got past the first major obstacle, which is a giant green snake that tears up and hovers at you in the Hall of the Mountain King. Don't try and deal with it yourself, it's the only advice on that one. This dragon is a different beastie of *Full Moon*. Though this is also a bear is still a bit demanding a job, a party who heads on searching your hard-earned treasures and hiding it in the most obvious of places, a clammed-and-then hostile dragons that pop up out of nowhere and

throw things at you, and a host of other problems.

It's a pity that the lengthy tedious descriptions, which were one of the attractions of the original, have had to go, but with the Dragon's bulky text display just reduced it's maybe paid as well as being of them would take up several screens. However at least you do get a look at the most tedious of all adventures, and it maybe a few of the problems and their solutions seem familiar (to the best and our old friend the burning torch) then remember that these were the originals. There's a score but no real treasure, which is also as it was in the original mainframe version.

One prediction — I had leading trouble

with the game till it eventually turned the tape into volume down very low indeed. The only other to go to give the game any by sending 50 to Crown Software Ltd 20 Bostel Avenue, Levenshulme, Manchester M15 0NU. As that is the end of the colossal adventure column for another month, except to say that I've recently been given a second preview of a kind of escape-adventure game written by one of our readers and which *Microdisk* will be publishing in the near future. I'm about to accept about it, but I will say that it's written with more packed into the program than I would have ever thought possible. It's going to write about it, but you'll have to wait till my lips have been unsealed.

Adventure Contact

To help periodical adventures further, we are publishing an *Adventure Hotline* — simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to Dragon User Adventure Help

line 1213 Littlewood Street, London W6C2H 7PP. As soon as enough entries have arrived, we will start printing them in the magazine.

Don't worry — you'll still have Adventure Trial to write to as well.

Adventure

Problem:

Name:

Address:

Mar 82

Adventure Contact

Adventure: Spring Problems: Use all of the co-ordinates, but don't do you use them all of the co-ordinates? Also, how do you get to the planet? **Name:** Clayton Pardo **Address:** 58 Castle Drive, Northborough, Massachusetts, Cambridge MA 01061.

Adventure: Black Sanctum Problems: Please read anyone today? He's with a lot of the co-ordinates? Also, how do I get out of the nipped mountain? **Name:** John Sullivan **Address:** 12 The Mount, Tregunna South Devon TQ14 5AG.

Adventure: The Rat Trilogy/Full Moon Problems: How do you get past the second door after opening the second? **Name:** John Llewellyn **Address:** Moss-protin Park Road, Ynyonwen, Swansea, SA5 5AP.

Adventure: Juxtaposition Problems: How do you tell the right eye from the left? I have a few sheets? **Name:** Steven Slide **Address:** 21 Waterloo Road, Burnley, Lancashire, BB10 2NS.

Adventure: Beyond of Oak V Problems: I can't get away from the JNL mountain road, or past

Name: Philip Dow **Address:** Hopton, Wetherham Road, Waltham, Cheshire, South-ampson, Merseyside. **Adventure: Ring of Darkness Problems:** Any help please **Name:** Karl Gerni **Address:** 64 West Ham Close, Basingstoke, Hants RG22 6PH.

Adventure: Jerusalem Adventure Problems: How do you be religious in Western Wall? What are the magic words? Where do you use them? **Name:** John Hastings **Address:** Newcastle, Somerset Street, Carnarvon, Scotland NN6 6QZ.

Adventure: Juxtaposition Problems: I cannot get past seemingly multiplying JNL mountain road. Please tell me how I can do this — if possible, send him sheet. **Name:** Simon Goodson **Address:** 15 St Stephen Rd, Penarth, Warrington.

Adventure: Sea Quest Problems: Getting Scuba gear from the Clerk, Mike Gains. **Address:** 48 Passworthy Station, Leicester LE17 5NF. **Adventure: Syzygy Problems:** Don't know how to deal with

Gerni, can't co-ordinates right. Can anyone help? **Name:** Stuart Gilchrist **Address:** 55 Yewtree Drive, Milton Keynes, Leicestershire, LE13 5LN.

Adventure: 60 Darkness Problems: How to get the King **Name:** Gavin Griffin **Address:** 55 Dal Street, Tallaght, Co. Dublin, Eire.

Adventure: Midway and the Minor Problems: Everything **Name:** Gavin Griffin **Address:** 55 Dal Street, Tallaght, Co. Dublin, Eire.

Adventure: Juxtaposition Problems: Cannot get the white key card off the computer and cannot find the music. **Name:** Mark Cooper **Address:** 18 Willow Drive, War Heat, Essex-on-Thames, ST9 7L2.

Adventure: Juxtaposition Problems: Have sword and shield abilities, but always do from Brown Pag. Can someone send a map? Also what use is crystal and Transm receiver? **Name:** David Eggleston **Address:** 9 Titter Road, Gresham, Cambs PE16 6SL.

Adventure: Return of the Ring Problems: How to get the ring out of the human village. **Name:**

Seven: Arkas Address: 105 Barnard, Hutton, Essex, CM18 1PH.

Adventure: Juxtaposition Problems: How do you get out of the first building without being shot by the first door? **Name:** Richard Tyler **Address:** 21 Windsor Park, Tundridge, Kent TN10 6DX.

Adventure: Return of the Ring Problems: Where can I get the blue key to get out of the maze at the beginning? **Name:** Emma Reader **Address:** 21 Watford Road, Yarnall, Somerset.

Adventure: Juxtaposition Problems: How do I get out of the Emerald Tower with the Emerald? What use is the gem in the necklace? **Name:** 519 Thompson **Address:** Ford View, Stoneham, Devon CV8 3PU.

Adventure: Ring of Darkness Problems: How do I get the key of the Jester? What do I do when I have the four rings? **Name:** Paul Gibbons **Address:** 25 Crossroads, Cuddington, Luton, Beds, LU1 4EP.

Adventure: The Ring Problems: Cannot pass the first hall. **Name:** J. Wright **Address:** 21 Oak Way, Clapham, South Hampshire, DN20 0PA.

PRISM MODEM 1000/2000


ROBERT A. JOHNSON

100

DragonDOS Firmware Memory Map

The Firmware data locations detailed below may be used for other purposes by the Basic ROM when DragonDOS is not installed, for example the USR routines store DragonDOS also uses RAM from 1536 to 3071 showing graphics page one to address 3072

234	Floppy Disk Controller Micro Command Byte. This is the byte sent to the hardware to specify what operation is to be performed. See hardware's data sheet for details.
256	Disk Drive number (1-6). The drive to be used in a sector read/write operation.
256-257	Disk Read/Write THROCK
258-259	Disk Read/Write SECTOR
	Disk Read/Write sector Buffer address. This is a 256 byte slice of memory from where the sector is to be written, or to where the sector is to be loaded.
248	Floppy Disk Controller Hardwired Error Status Bits. This is the error number returned by the hardware to be converted into a DragonDOS error code.
241	Current File Number. The number of file (1-15) most recently accessed.
244	Number of disk drive sectors and tracks for current drive. Coding is as follows: 00 = 1 side, 40 tracks 01 = 2 sides, 40 tracks 02 = 1 side, 80 tracks 03 = 2 sides, 80 tracks The format of a disk is taken from the directory track on the first access to a disk after track on or read.
245	File Read/Write Flag. A zero value specifies a file read operation, non zero specifies file write.
258	Disk I/O in progress flag. A non-zero value signals that disk I/O is continuing and that the motor should not be turned off by the IRQ routine.
1641	Internal countdown to disk motor off. The DragonDOS I/O routine is used to decrement the location if it is not already zero. When it reaches zero the disk motor is switched off.
1544	Disk Auto Verify error flag. A non-zero value causes the user to be read after a write to verify that the data has been saved correctly. A zero value disables this feature. The default setting is ON.
1548	Current default disk drive number (DEPD). This is the drive to be used by operations which do not specify a particular drive number. It is set from basic by

1540-55	the OFFSE command.
	AUTO command line number. The current line number being used by the AUTO command.
5551-552	AUTO command store next value.
5553	Program LOAD/RUN flag. A zero value indicates that the program is to be loaded, a non-zero value indicates that the program is to be loaded and RUN.
1555	AUTO command error flag. A non-zero value indicates that the AUTO command is being used.
1556	ERRNOH command error flag. A non-zero value indicates that the ERROR GOTO instruction will not cause the program to stop.
1557-58	ERRNOH trap line number. The Basic line number of the error routine.
1558-59	Line number of last error (GRL).
1561	Error code of last Basic error (GRL).
1615-16	Start address of program loaded.
1628-31	Length of program loaded.
1632-33	Entry address of program loaded (for machine code programs).
1637-38	USR routines address table. The addresses for the 15 USR routines are stored here when DragonDOS is installed.
1637-3796	Drive table. 4 bytes per parameter — 1 per drive.
1637-38	Control flag. A non-zero value indicates that the drive is online and has been accessed.
1641-44	Drive Current Track. If the drive is online, this byte specifies which track the head is currently over.
1645-46	Head stepping rate. This should only be changed if slower drives are used.
1785-86	Disk sectors per track. The number of sectors per track on the disk in the drive.
1725	File CIOB is 10 (one per open file) each 31 bytes long.
2846	1024 bytes of Data File Sector Buttons — 256 bytes each.

DragonDOS Hardware Locations

The Floppy Disk Controller used in the DragonDOS interface is a WD 2797. The following Hex locations are used by the 2797.	
FF48	Micro command/Drive status Register.
FF41	Track Register.
FF42	Sector Register.
FF43	Drive Register.
The disk motor, as controlled by location FF48, A zero value turns off the motor. A non-zero value switches on the motor and selects the particular drive.	

DragonDOS Firmware Routines

The following ROM routines may be used by the machine code programmer. All addresses are in decimal and obviously apply only when DragonDOS is installed.

Write Sector DragonDOS 2456
Writes a sector (256 bytes) out to disk. The locations 235 to 239 must be set up correctly as detailed above on entry. After the 2 condition code will be clear if an error has occurred and the 0 register will contain the error code.

Read Sector DragonDOS 45412
Reads a sector (256 bytes) from disk. The locations 235 to 239 must be set up correctly as detailed above on entry. After the 2 code will be clear if an error has occurred with the 0 register containing the error.

Drive in DragonDOS 24569
Initialises the DOS hardware. On return the status register at FF40 will have the following meaning: Bit 1 = Index input drive = Write Protect status.

Hardware I/O DragonDOS 45412
Vector at 45176.

This is a very low-level routine used by DragonDOS to send commands to the hardware. This routine is used by the sector read/write routines. A knowledge of the hardware is required to use this routine. The command byte must be set up in location 234.

Format Disk DragonDOS 52108
Formats the disk in DEPD drive. All data on the disk will be lost. An empty directory will also be set up on the newly formatted disk.

Get Free Space DragonDOS 52681
Vector at 49156.

Returns the amount of free space (in bytes) on the current drive (DEPD) in the Floating Point Accumulator.

Convert Sector DragonDOS 54055
On entry the Y register should contain the logical sector number which is to be converted into a physical track and sector number in locations 256/257. Logical sectors start at number 0 at track 0, sector 1.

Directory Disk DragonDOS 54056
Produces a directory of the disks in DEPD. The drive number in DEPD (location 171) initiating operation status and free bytes.

Beep DragonDOS 58229
On entry the 0 register should contain the number of 'beeps' to be output. The beep sound is that produced by the Basic 2327 command.

Boot Disk DragonDOS 58230
Boots an OS of the disk in DEPD. If the disk is not a valid operating system disk (see below) then a BRT error is produced. Otherwise the OS boot up program is loaded and entered in location 9730. In other cases the routine does not return.

Wait Time DragonDOS 58237
On entry the X register should contain the number of milliseconds for the routine to wait before returning. The Break Key is also scanned for.

Competition Corner

Taking chances

Answers to *Competition Corner*,
Dragon User, 12-13 Little Newport
Street, London EC2M 4PP

IT HAS been said that in no other branch of mathematics is it so easy to blunder as in probability theory. A statement which later appears often bears out.

In fact, the probability that certain event will occur is the number of favourable cases divided by total number of equally likely cases. Similarly, the probability that the event will not occur will be the number of unfavourable cases divided by Total number of equally likely cases.

For example, the probability of drawing a diamond from a full pack will be $\frac{13}{52}$ or 0.25, and the probability against will be $\frac{39}{52}$ or 0.75. Note that the sum of these two probabilities is 1, so from the definition a probability of 1 means certainty and a probability of 0 means impossibility.

Difficulty in calculating probability often occurs when a number of factors are combined and these fall into two main groups: (a) The probability of either this or that occurring; or (b) The probability of both this and that occurring. To take the first instance, we have to consider the probability of drawing a diamond or a spade; or (2) Suppose that we wish to calculate the probability of drawing either a diamond or a spade card. The temptation is to add the odds for drawing a diamond ($\frac{13}{52}$) to the odds for drawing a spade ($\frac{13}{52}$). This would give the total probability of $\frac{26}{52}$, which would be incorrect since we have counted twice those cards that are both diamonds and spades. What we need to find is the probability of drawing either a diamond, a red picture, a heart picture, and a spade picture. This is given by $\frac{13}{52} + \frac{13}{52} + \frac{13}{52} + \frac{13}{52} = \frac{52}{52}$. To find the probability against simply subtract this value from 1.

The second of our main groups relates to cases where we wish to assess the probability that both this and that will occur. To take our card-drawing example we might

wish to calculate the probability of drawing a card which is both a diamond and a picture. In this case we simply multiply the probability of picking a diamond ($\frac{13}{52}$) by the probability of picking a picture ($\frac{13}{52}$). The product, $\frac{13}{208}$, gives the answer that we would expect as there are three diamond picture cards in the pack of fifty-two cards. Once again, to find the probability against simply subtract from 1.

In some problems it is easier to calculate the probability against an event and subtract this from 1 to find the probability for the event. For example, if I throw six ordinary dice, what is the probability that I will throw at least one six? Since the probability against throwing a six with one die is $\frac{5}{6}$, the probability against throwing a single six with six dice will be $\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} = \frac{125}{216}$. This value is 0.578 and so the probability for throwing at least one six would be 1 minus 0.578, that is 0.422.

Before turning to this month's competition question there is a little problem whose solution I shall give next month. It is a problem which is set in such a way as to mislead the solver in assessing the probabilities involved. You are invited to attempt to participate in a small bet. He offers you three cases of dominoes separately. In the first box are two red marbles, in the second box two white marbles, and in the third are one of each colour. The boxes are closed and are mixed up. You are then invited to choose one of the boxes and without looking make a remove one of the marbles. Suppose that it is red, your friend might say: 'Obviously the box that you have chosen is not the one containing the two white marbles, so therefore it must be either the red one or the red/white box; the remaining marbles are an equal chance of being red or white. I propose to guess which colour it is and offer you an even money bet on the



outcome. If I am correct I win. If I am wrong I lose! Would you be wise to accept the bet?

For this month's competition, as a demonstration of probabilities, I assembled a number of volunteers into a room and handed each one of them a slip of paper. They were then asked to write down any year in the range 1 to 1000 inclusive. This was to be done secretly without consulting with the others present. The papers were then collected. I knew from the number of volunteers present that there was a slightly less than even chance of any two members being the same, but that if I also wrote down a date and added it to the pile the probability would rise to a better than even chance. In other words, the addition of one extra number would increase the probability of at least two dates coinciding from just under 0.5 to just over this value.

Can you say how many volunteers there were? As a clue, there are fewer than you might at first sight think!

Prize

For this month, we are offering 10 prizes of the newest game for the Spectrum... from the famous software house, Beamstalker from Atari. While in this 48 screen arcade adventure, you must collect treasure in Glendora, avoiding such hazards as giant caterpillars, giant thesauri and marvellous birds. You've seen the programme, now play the game!

Rules

To win your own copy of Bean Stalker, all you have to do is put your brain into gear and work out the answer to this month's puzzle — showing how you solved it. But please don't send us cassettes containing your program — hard copies only.

Make sure that your name and address

is clearly printed on your entry and mark your envelope 'April Competition'... or you might risk disqualification.

As a tie breaker, complete the following sentence in 10 words or less: 'I want to visit Glendora because...'. As usual, preference will be given to entries that make the editorial staff giggle.

January winners

The 20 lucky winners of the Melbourne House 'Enter the Dragon' cassette are as follows: Mark Lister of Lymington, West Yorkshire; R. C. Woods of Bland, Essex; Charles Gaby of Windsor Hill, Co. Cork; Simon Aubrey of Seaford, Wilt; D. R. Barber of Sutton Coldfield, West Midlands; P. D. Mollison of Twicken, Essex; M. Jackson of Chesham, Bucks.

Chris Jolly of Grove Park, London; K. Lighthowler of Halifax; D. R. Sharplee of Macclesfield; Luis Martinez of San Sebastian, Spain; Stephen Hunter of Highbury, Southampton; S. A. Newman of Addlestone, Surrey; J. Taylor of Sutton, Middlesex; P. L. Bates of St Albans; Guyana Simon of Stoke, France; D. C. Poulton of Macclesfield; M. Glemmings; Geoffrey Marshall of Belper, Derby; and J. J. Randall of Plumstead, London. Congratulations one and all.

Enter for the 16 break (1986) is the Year of the Dragon because... included many references to St George — delicious and otherwise, but generally not known to most. A New Year's 'because' it will be a roaring year.

I hope no was venturing to the hot summer we are all praying for!

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Abstract



Figure 1 *continued*

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